

Efficient second order counter-propagating parametric processes in centrosymmetric materials.

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When a nonlinear Interaction is considered In the framework of a photonic crystal, the structuring of the material has proven to be highly relevant to reach a phase matched and an enhanced second order nonlinear interaction [1-3]. However, perhaps one of the most outstanding effects, but less explored, is the possibility to obtain a nonvanishing second order nonlinear interaction in centrosymmetric materials.

Experimental prove of the fabrication of a novel centrosymmetric material configuration for efficient 2nd order nonlinear processes is demonstrated. We show that several highly nonlinear organic molecules can be covalently bond onto the surfaces of specifically synthesized polystyrene microspheres, which allows the formation of a three-dimensional nonlinear photonic crystal. SHG measurements indicate that with such materials one obtains one of the highest conversion efficiencies for quadratic nonlinear process in centrosymmetric materials.

In addition, we a consider counter-propagating interaction in the framework of the same three-dimensional nonlinear photonic crystal, where perfectly phase matched interaction can be achieved, as a result of a nonlinear interaction at these interfaces. If one of these photonic materials with a sufficiently high nonlinearity is fabricated, one whould be able to observe the reflectorless backward parametric oscillation predicted by S. E. Harris thirty-nine years ago [4].

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